The American Fertilizer

Vol. 95 OCTOBER 25, 1941 No. 9

Published every other Saturday. Annual subscription: In the United States, $3.00; Canada and Mexico, $4.00; other countries, $5.00. Entered as second-class matter, January 15, 1910, at the Post Office at Philadelphia, Pa., under Act of March 3, 1879. Registered in United States Patent Office. Publication office, 1330 Vine St., Phila., Pa.

...THE...

AMERICAN FERTILIZER

"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

Vol. 95 OCTOBER 25, 1941 No. 9

Composition of Ammoniated Superphosphate

By J. B. S. HOLMES

Ammonia Department, E. I. duPont de Nemours & Co., Inc., Wilmington, Delaware

FOR more than ten years the fertilizer industry has taken advantage of the fact that superphosphate will absorb liquid ammonia, fixing the nitrogen during the process in a useful form of high crop-producing value. Anhydrous ammonia, available in large quantities and at low cost as a result of the United States' new synthetic nitrogen industry, was first utilized for the ammoniation of superphosphate. This has been displaced by newer ammoniating solutions specifically designed for the fertilizer industry, which make possible the incorporation of larger quantities of nitrogen in the superphosphate than could be obtained from anhydrous ammonia.

At Belle, West Virginia, the Du Pont Company produces Urea-Ammonia Liquors for the fertilizer industry. These consist of urea dissolved in an ammonia-water system, thereby furnishing a mixture of "free ammonia," which reacts with the superphosphate, and "fixed nitrogen" (urea) which is precipitated in the fertilizer mixture as fine crystals that are non-reactive. UAL-B, the liquor most extensively used, contains 45.5 per cent nitrogen of which 20.5 per cent nitrogen is present as urea and 25 per cent as free ammonia.

The liquor is shipped in tank cars to the fertilizer plant and forced by means of air pressure through suitable piping to a small measuring tank in which the desired charge is measured. It is then led directly into the fertilizer mixer through a spray pipe which insures intimate contact and practically instantaneous absorption by the superphosphate.

In addition to providing low-cost, easily-handled nitrogen, ammoniating solutions produce dry, free-flowing fertilizers which cure more rapidly and tend to be less dusty than when made by the older method. The liquid forms of nitrogen, therefore, have found wide acceptance. It is estimated that 80 per cent of the fertilizer plants manufacturing 5,000 tons or more of fertilizer annually, employ ammonia liquors.

It is interesting to note the effect that ammoniating liquors have had in changing fertilizer formulation practice. Approximately 60,000 tons of nitrogen in the form of liquors of all kinds were supplied to fertilizer manufacturers in the 1939-1940 season. These have naturally displaced other materials. The extent of this change is shown in Table I.

Table I

The Use of Various Forms of Nitrogen in Mixed Fertilizers in 1925 and 1940

(Continental U. S. A.)

	Per Cent of Total in	
	1925	1940
Ammonium Sulphate	38.1	38.7
Nitrates	21.9	11.4
Synthetic Organics	11.9	11.0
Natural Organics	31.0	12.1
Ammonia Liquors*		26.8

* Includes dissolved urea and nitrates.

Data for 1925 are given by Mehring and Peterson.[1] Figures for 1940 are from the best estimates available. It is evident that during this fifteen-year period, ammoniating liquors have developed into a major source of fertilizer nitrogen, second only to ammonium sulphate. The use of natural organic materials and

[1] A. L. Mehring and A. J. Peterson, USDA Circular No. 315 (April, 1934).

nitrates in mixed fertilizers has decreased during the same period. "Uramon" Fertilizer Compound, a du Pont product first produced in 1937, accounts for a substantial percentage of the synthetic organic nitrogen in 1940.

Chemistry of Superphosphate Ammoniation

When UAL-B is added to a superphosphate, the free ammonia in the liquor reacts with the free phosphoric acid, forming mono-ammonium phosphate. Additional quantities of ammonia convert mono-calcium phosphate to mono-ammonium phosphate and di-calcium phosphate. These reactions are shown in equations (1) and (2):

(1) $H_3PO_4 + NH_3 \rightarrow NH_4H_2PO_4$
Phosphoric acid — Ammonia — Mono-ammonium Phosphate

(2) $CaH_4(PO_4)_2.H_2O + NH_3 \rightarrow NH_4H_2PO_4 + CaHPO_4 + H_2O$
Mono-calcium Phosphate — Ammonia — Mono-ammonium Phosphate — Di-calcium Phosphate

When reaction (2) is completed, further additions of ammonia react with mono-ammonium phosphate to form di-ammonium phosphate, as in equation (3):

(3) $NH_4H_2PO_4 + NH_3 \rightarrow (NH_4)_2\,HPO_4$
Mono-ammonium Phosphate — Ammonia — Di-ammonium Phosphate

Under commercial operating conditions, where temperatures are kept low and storage time is short, at least some of the di-ammonium phosphate is stable. However, at high temperatures and in the presence of moisture, di-ammonium phosphate will decompose, liberating ammonia. This in turn, will react with di-calcium phosphate and gypsum, forming ammonium sulphate and precipitated tri-calcium phosphate:

(4) $2CaHPO_4 + CaSO_4 + 2NH_3 \rightarrow Ca_3(PO_4)_2 + (NH_4)_2\,SO_4$
Di-calcium Phosphate — Calcium Sulphate — Ammonia — Tri-calcium Phosphate — Ammonium Sulphate

This precipitated tri-calcium phosphate, probably because it contains no fluorides, is considerably more available to plants, as determined by vegetative experiments, than raw rock phosphate. "Available" phosphoric acid, as determined by official analysis methods, consists of water-soluble phosphates and those compounds dissolved by a definite quantity of neutral ammonium citrate solution. The latter includes all the di-calcium phosphate and about 20 pounds P_2O_5 as precipitated tri-calcium phosphate, in addition to small quantities of other phosphates, such as magnesium ammonium phosphate. The portion of tri-calcium phosphate in excess of 20 pounds P_2O_5 is insoluble and usually referred to as "reverted" phosphate. There is some evidence to indicate that basic tri-calcium phosphates and apatite may be formed under certain conditions; these are insoluble in the citrate solution.

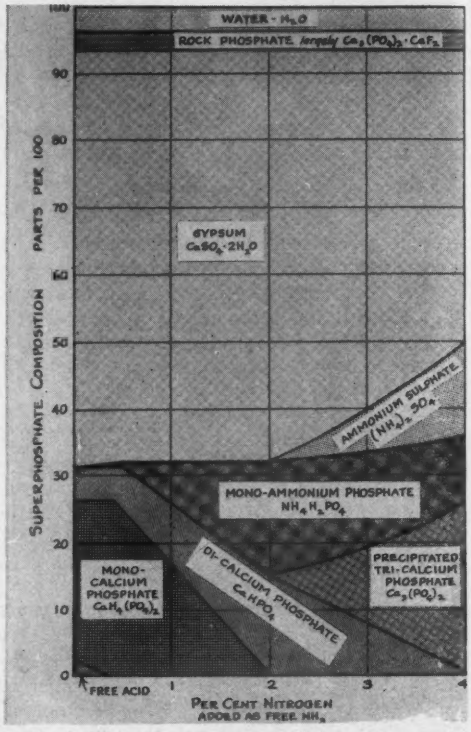


FIG. 1. Effect of progressive ammoniation on the composition of a typical superphosphate.

Composition of Ammoniated Superphosphate

Fig. 1 shows the effect of progressive ammoniation on the composition of a typical superphosphate. The reactions already discussed may be followed on this figure. The addition of about 2 per cent nitrogen as free ammonia completes reaction (1) and (2). Further additions of free ammonia initiate reactions (3) and (4).

Fig. 1 is based on results of research work on phosphate reactions conducted by Keenen.[2] In order to insure completion of all reactions, Keenen purposely maintained abnormally high

[2] Frank G. Keenen, Ind. & Eng. Chem., Vol. 22 (Dec., 1930).

moistures and temperature. The formation of precipitated tri-calcium phosphate and ammonium sulphate, as indicated in this figure, is somewhat higher than would be encountered in commercial practice.

Fig. 2, prepared from the same data, illustrates the distribution of phosphates in fertilizers containing 8 per cent available phosphoric acid. That shown in Chart A is ammoniated at the rate of 66 pounds UAL-B per ton, furnishing a total of 1.5 per cent nitrogen. This rate would represent the minimum used in commercial practice. Approximately 57 per cent of the phosphoric acid is water-soluble and therefore subject to rather rapid "fixation" in the soil. The balance is citrate-soluble and therefore less subject to "fixation."

Chart B indicates the effect of increasing the amount of UAL-B to 85 pounds per ton, supplying 1.94 per cent nitrogen, and representative of the average commercial practice. The phosphoric acid is now derived from three sources of differing solubilities. Water-soluble mono-ammonium phosphate, capable of rapid "fixation," comprises 53.5 per cent of the total. More slowly "fixed" citrate-soluble di-calcium phosphate accounts for 35.5 per cent, and 11 per cent citrate-soluble tri-calcium phosphate has been formed. This compound is even less subject to soil "fixation."

It is evident, therefore, that ammoniation converts superphosphate, composed very largely of water-soluble, easily "fixed" mono-calcium phosphate, into "available" phosphate compounds of varied solubility, some of which are less susceptible to soil "fixation."

For easy reference to Fig. 1, the ammoniation rates used in Charts A and B, when converted to the basis of a ton of superphosphate, are equivalent to 2 per cent nitrogen as free ammonia and 2.32 per cent nitrogen as free ammonia, respectively.

Fig. 3 illustrates the nitrogen distribution in the same manner. At the low ammoniation rate, UAL-B forms two nitrogen compounds, urea and mono-ammonium phosphate. With the higher rate, sulphate of ammonia is also formed. The precipitation of urea and the formation of the nitrogen and phosphate compounds by chemical reaction within the mixture shows how the use of Urea-Ammonia Liquor tends to overcome segregation of the fertilizer ingredients.

Value of Phosphoric Acid in Ammoniated Superphosphate

It has already been shown that ammonia converts water-soluble mono-calcium phosphate to water-soluble mono-ammonium phosphate, citrate-soluble di-calcium and tri-calcium phosphate and, in some instances, insoluble tri-calcium phosphates. In order to "cure" superphosphate fertilizers, manufacturers must neutralize the free phosphoric acid with an active alkali. If ammonia is not utilized for this purpose, some other alkali, such as cyanamid, lime, vegetable potash wastes or limestone, is employed. Keenen and Morgan[3] and Beeson and Ross[4] have shown that these citrate-soluble and insoluble phosphates are formed, in varying degree, when such neutralizing agents are used.

The high availability of mono-calcium phosphate, mono-ammonium phosphate and di-calcium phosphate is generally recognized. The water-soluble phosphates react with soil components to form relatively insoluble phosphates

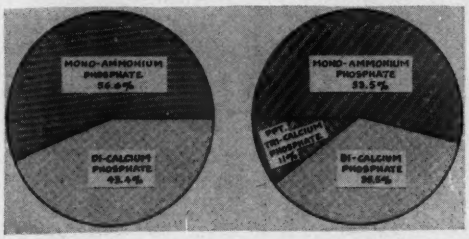


FIG. 2. The distribution of phosphoric acid in an X-8-X fertilizer.
A—Ammoniation rate: 20 lb. free ammonia per 890 lb. superphosphate.
B—Ammoniation rate: 25 lb. free ammonia per 890 lb. superphosphate.

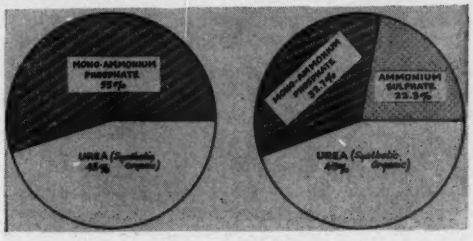


FIG. 3. The distribution of nitrogen supplied by UAL-B in an X-8-X fertilizer.
A—Ammoniation rate: 66 lb. UAL-B per 890 lb. superphosphate.
B—Ammoniation rate: 85 lb. UAL-B per 890 lb. superphosphate.

(Continued on page 22)

[3] Keenen and Morgan, Ind. & Eng. Chem., Vol. 29 (Feb., 1937).
[4] Beeson and Ross, Ind. & Eng. Chem., Vol. 26 (1934).

Grassland Farming in New England*

By A. B. BEAUMONT

Agricultural Extension Service, Amherst, Massachusetts

MOST New England soils are naturally poorly adapted to grass culture. This statement may not be pleasing to the enthusiastic advocates of grassland farming in this section. It is equally true, and perhaps more pleasing, to say that a high percentage of New England soils are potentially well adapted to grass culture. The reasons for these statements will presently be given.

The early New England settlers from the Old World, not being accustomed to clearing land, sought first the natural clearings or those made by the Indians. Natural meadows, or intervals as they were called, first-bottom land along the streams, were highly prized because of the wild hay which they furnished with no effort by the farmer except the harvesting. Consequently, the stream valleys were the first areas settled. Thus we se the Plymouth colonists, in their expansion, by-passing the heavily wooded uplands of the Central Plateau of Massachusetts and settling in the Connecticut Valley before pushing into the wilds of the plateau.

New England colonists found a wooded wilderness. Probably 99 per cent of the area was wooded when settlement began. For 250 years the settlers fought the forests back foot by foot, clearing or "making" land, as they said, a little at a time year after year. Then, when their vigilance lapsed or declined with a decline in agriculture, the forest slowly crept back into much of the land from which it had been ousted. Ingalls, in his well-known tribute to grass, said, "Streets abandoned by traffic become grass-grown like rural lanes, and are obliterated." That statement was very apt for Kansas when it was written. In New England, before the days of heavy vehicular traffic or macadam highways, it was a task to keep the highways from growing up to brush, and some of the towns had laws which required every man to work one day a year in clearing bushes from the highways.

Today, every New England agronomist knows that brush, among which are many tree species, quickly takes over pastures that are improperly managed. In time brush gives way to forests. The well-known Cummings pasture of the Connecticut Experiment Station at Storrs was primarily adapted to woods before it was improved by treatment with certain soil supplements. Posts used for fencing the experimental plots were taken from trees growing on the land. Just how many times this area had been cut over is not known to this writer, but it was probably more than twice. This sort of reoccupation of uplands by tree species is the usual occurrence in New England. Hence no particular ecological acumen is necessary in order to arrive at the conclusion that the forest is the natural climax of these lands. Recognition of this basic truth should prove helpful to all concerned with the management of the soils of this area for grass culture. It should be clear, for instance, that merely removing brush from a pasture causes no permanent improvement.

Grasses Comparatively New

Some plant evolutionists are of the opinion that the grasses are comparatively newcomers in the plant kingdom. They could not exist in primitive soil conditions in which more primitive forms of plant life, such as lichens and mosses, thrive. There are differences among grasses in respect to their requirements for optimum growth, but generally their nutrient requirement is higher than that of the woody plants. There are differences among grasses also as to their value for forage. Generally, the grasses most valuable for forage or grain require a comparatively high fertility level for optimum growth; for example, note corn, wheat, and timothy. This requirement has an important bearing on that question of adaptability to soils and soil management. None of the grasses or legumes now cultivated for forage in New England is a native of the region. The terms "English hay" and "white Dutch clover" are reminders of the foreign origin of forage crops.

The question of adaptability of grasses to New England soils may be approached from different angles. First, consider the general character of the soils. Generous precipitation, forest cover, and a cool climate together have produced podzols and podzolic soils. At elevations above 1,500 feet in southern New England and at decreasing elevations in central and northern New England, and on Cape Cod, are found

* Reprinted from "Better Crops with Plant Food," October, 1941.

moderately to well-developed podzols. These "northern gray" soils have had their topsoil severely depleted of basic, and to some extent also of the acidic, nutrients required by grasses. Podzolic soils, likewise, have had their constituents reduced by the podzolization process but to a less extent.

Podzolization of New England soils explains why numerous experiments by the experiment stations and tests by farmers have shown that grasses and clovers generally respond well to basic nutrients and nitrogen. Response to phosphorus has been obtained also, particularly on soils that have been partially exhausted by long-time cropping. Lime, a base that is removed in large quantities by the podzolization process, is the first limiting factor in most New England soils in the production of both grasses and clovers. Potash, another basic nutrient, is likewise required by both types of forage. These remarks apply particularly to soils developed from granites, gneisses, and schists, the kinds on which most of the experiments have been conducted.

The question of adaptability may be considered also from the standpoint of soil differences induced by method of formation. The best adaptation is found in well-drained alluvial, lacustrine, and marine soils of medium and heavy texture because such soils represent the cream of other soils from which they have been washed. Examples are Ondawa, Addison, and Orono soils. The next best adaptation is found in the upland till soils so situated and of such texture as not to be droughty. Such soils may be expected to contain moderate amounts of all nutrients required by plants. Examples are Gloucester and Charlton soils. The least adaptable group for grasses consists of outwash soils because they represent the coarser fractions of the upland soils separated from the finer particles which have been carried to lower levels. These soils are often excessively drained externally and internally. Of the outwash soils the Hinckley series with a hummocky topography, and Danby, its podzol equivalent, are the least adaptable to cultivated grasses.

Differences in adaptability of New England soils to grasses are due also to the character of the parent material from which the soils have been developed. Other things being equal, those soils which have more or less limestone in the parent material have relatively high adaptability. Soils from materials in which limestone and schist are important constituents are among the best upland grass soils of the region. Among these, Stockbridge, Lenox, and Worthington soils may be mentioned. There are also those soils derived from lake or marine sediments containing lime, such as Addison and Vergennes from Champlain sediments, and Orono from marine sediments along the northern New England coast. These are good grass soils.

Other points of importance are texture and depth of soil. Some series, such as Gloucester, have a wide textural range. Those of medium to heavy texture are preferred to those of light texture because of better water-holding capacity and also better mineral composition. Gloucester loam is a much better grass soil than Gloucester sand. The heavier members of the Merrimac series, especially with fair depth to the gravel layer, are fair grass soils, although the Merrimac soils as a group are not ideal grass soils. Shallowness of upland till soils is often correlated with stoniness. Shallow soils, especially if associated with steepness of slope, are poorly adapted to grass because of their susceptibility to drought. Conversely, the adaptability of some New England soils to grass is poor because of excess moisture, which in some cases may be removed by drainage.

To summarize: New England soils generally have poor natural, but good potential, adaptability to cultivated grasses suitable for forage. Forests are the natural climax of most of the area. Supplements must be added to most soils to insure quantity and quality of forage adequate for a prosperous and profitable grassland economy. While New England soils are generally poorly adapted to grasses, there are differences among these soils. Some require less supplements than others; some are so poorly adapted to grassland farming that they should not be used for that purpose. The better adapted soils, properly managed, will produce abundant forage of good quality. The way to make them produce is known. The agronomic aspects of the problem are better known than are the economic, but that is another matter.

MEYERS LOANED TO OPM

Herbert H. Meyers, manager of the purchasing department of Virginia-Carolina Chemical Corp., has been loaned on a part-time basis to the Office of Production Management, at the latter's request, in the present national emergency. His duties will be in connection with the chemical section of OPM with offices located in Washington, D. C.

Six Million Farmers Improve Land by Conservation Measures in 1940

NEARLY 6 million farmers, working 80 per cent of the total cropland of the United States, protected and improved their farms by conservation measures of the 1940 AAA Farm Program, the Department of Agriculture reported on October 17th.

Farms comprising nearly 365 million acres of cropland benefited under the 1940 Agricultural Conservation Program, compared with 355 million acres the previous year, said R. M. Evans, National AAA Administrator, in summarizing conservation practices for 1940.

The major conservation accomplishments under the 1940 program included new seedings of 41 million acres of legumes and grasses; 22 million acres of green manure and cover crops; 29 million acres of land protected by major erosion control practices such as contour farming, strip-cropping and summer fallow; construction of 281 million feet of terraces; application to the soil of more than 12 million tons of lime and 936,000 tons of superphosphate; and 525,000 acres of forest trees planted or improved.

Several other major practices—carried out largely in the Western Range area—included 29 million acres of land reseeded to grass by deferred grazing, construction of 75,000 earthen dams and reservoirs, and 20 million feet of spreader terraces.

"Preserving and building the soil, as these 6 million farmers have done on a cooperative nationwide scale, is agriculture's contribution to abundance and a continuing healthy economic life," said Mr. Evans. "After eight years of nationwide conservation practices, the farmer knows that it pays to return to the soil the richness that many of his crops take from it.

"Furthermore, because U. S. farmers have realized the economic value of guarding the fertility of the soil from year to year, they are more fully prepared to meet today's urgent need for all-time high production of certain foods and fibers to provide for the health and strength of our own people, as well as those of nations across the seas who are struggling for freedom against destructive world forces.

"The American farmer has been asked to produce more in 1942 than he ever has before of many products—especially dairy, hog, and poultry products—all needed in quantity by America, and in countries resisting the dictators. His stocks of feed are large, and his farm plant is ready."

Fertilizer and Lime Applications

An example of the growing awareness of farmers to the importance of conservation and soil-building, Administrator Evans pointed out, is the fact that under the AAA program, they applied 12,000,000 tons of lime to their soil during 1940—more than twice the amount used in 1939 when the total was 5,792,000 tons. "This record," he said, "is evidence of the farmer's recognition of the importance of pastures and grass land to production of livestock and dairy products for which there is such a vital need in the present emergency."

In addition to the lime, some 936,000 tons of superphosphate were applied, which compares with 637,000 tons used in 1939 to make hay and pasture lands more productive, the Administrator said. Farmers voluntarily took large quantities of lime and superphosphate in place of cash conservation payments. The quantities by States are shown in Table I.

Under the 1940 program, forest tree practices were carried out on approximately 525,000 acres, 173,000 acres more than in 1939. This included more than 144,000 acres of tree planting, compared with 58,000 acres planted in 1939. The balance of the acreage was improved chiefly by maintaining and improving stands of trees, and rehabilitating woodlands. In addition to the regular forest tree practices, the AAA has further encouraged tree planting through a special allowance which farmers may earn only by planting trees.

An important development in recent years, particularly to Southeastern agriculture, has been the increased use of green manure and cover crops which can be used as a protective covering on land subject to severe erosion and leaching during winter months. Under the 1940 program, farmers planted some 22 million acres of green manure and cover crops. This practice is encouraged through special purchase and loan programs designed to stimulate production of such seed as Austrian winter peas, vetch, and crimson clover.

The more than 41 million acres of new seedings of legumes and grasses for which farmers earned payments in 1940 represent a further movement toward conservation farming, Mr. Evans pointed out. Farmers are putting more and more reliance on legumes and grasses in their farming operations, and at the same time are maintaining adequate supplies on fewer acres at lower costs.

Farmers protected more than 29 million acres of farm land in carrying out major erosion control practices as contour farming, strip-cropping, and protection of summer fallow against wind and water erosion. Other practices included construction of 281 million feet of terraces.

Improvements in Range Lands

An important part of the Agricultural Conservation program during 1940 were practices carried out on the nation's range lands. Ranchers and farmers in the Western Great Plains area made further strides in meeting three of their most serious problems—restoring grass to the range, conserving water, and controlling wind erosion.

Approximately 29 million acres of land were reseeded to grass by deferred grazing in 1940. To conserve water for livestock some 75,000 earthen dams and reservoirs were built, more than twice as many as in 1939. To retard water runoff and control erosion, ranchers and farmers built 20 million linear feet of spreader terraces.

Special practices for the control of wind erosion, such as contour listing, and leaving stalks of sorghum and broom corn on the ground during the winter, were carried out in many Great Plains areas. Experience of farmers in these areas in 1939 led to localized countywide wind erosion programs in 1940.

Table 1

State and Region	Fertilizer and Lime Applications: Limestone (tons)	Fertilizer and Lime Applications: 16% Superphosphate or its equivalent (tons)
Maine	56,810	17,579
New Hampshire	25,588	16,148
Vermont	53,929	35,204
Massachusetts	48,538	12,439
Rhode Island	5,618	1,367
Connecticut	49,204	7,997
New York	510,245	99,706
New Jersey	91,378	8,136
Pennsylvania	814,374	26,375
Northeast	1,655,684	224,951
Illinois	2,012,905	6,848
Indiana	677,275	1,736
Iowa	1,018,410	1,274
Michigan	294,132	1,690
Minnesota	41,919	337
Missouri	1,131,541	6,915
Nebraska	15	8
Ohio	636,257	6,952
South Dakota	86	1
Wisconsin	692,942	9,943
North Central	6,505,482	35,704
Delaware	36,554	365
Maryland	191,499	4,600
Virginia	567,552	61,008
West Virginia	344,286	40,454
North Carolina	300,312	22,449
Kentucky	1,193,212	210,899
Tennessee	759,435	84,874
East Central	3,392,850	424,649
Alabama	71,981	77,844
Arkansas	57,443	32,866
Florida	55,816	20,810
Georgia	83,700	32,144
Louisiana	1,216	4,641
Mississippi	3,584	12,166
Oklahoma	5,592	484
South Carolina	117,574	1,778
Texas	10	4,040
Southern	396,916	186,773
Arizona	.....	746
California	.....	11,258
Colorado	.....	1,152
Idaho	.....	6,050
Kansas	31,013	1,384
Montana	.....	319
Nevada	.....	227
New Mexico	.....	6,465
North Dakota	.....	13
Oregon	18,585	17,904
Utah	.....	2,207
Washington	6,426	15,987
Wyoming	.....	304
Western	56,024	64,016
U. S. Total	12,006,956	936,093

THE AMERICAN FERTILIZER
ESTABLISHED 1894
PUBLISHED EVERY OTHER SATURDAY BY
WARE BROS. COMPANY
1336 VINE STREET, PHILADELPHIA, PA.

A MAGAZINE INTERNATIONAL IN SCOPE AND CIRCULATION DEVOTED EXCLUSIVELY TO THE COMMERCIAL FERTILIZER INDUSTRY AND ITS ALLIED INDUSTRIES

PIONEER JOURNAL OF THE FERTILIZER INDUSTRY

WARE BROS. COMPANY
PUBLISHERS
1336 VINE STREET PHILADELPHIA, PA.

A. A. WARE, EDITOR

ANNUAL SUBSCRIPTION RATES

U. S. and its possessions, also Cuba and Panama.....$3.00
Canada and Mexico 4.00
Other Foreign Countries 5.00
Single Copy ..... .25
Back Numbers ..... .50

Vol. 95 OCTOBER 25, 1941 No. 9

Principal Articles in This Issue

Fertilizer Manufacturing Profits

A recent survey of industrial corporation reports, published by the Federal Trade Commission, affords an interesting and thought-provoking comparison between the fertilizer industry and the other major manufacturing groups of this country. A representative selection was made from the 1939 returns of 76 industries, 780 corporations being selected, whose output comprised about 63 per cent of the total production of these industries. On a total investment of 28 billion dollars, sales amounted to a little less than 25 billions, while net income, after interest charges and taxes, amounted to $2,127,000,000, a return of 7.56 on the total average capital employed during 1939.

With these figures in mind, the section on the fertilizer industry is instructive, to say the least. The six fertilizer companies chosen as representative of the industry were not the six largest concerns but included both large and intermediate sized companies, with sales equivalent to 41.1 per cent of the total industry output.

The total assets of these six companies were valued at about 118 million dollars, with sales of 76¼ millions and net profit after interest and taxes of $1,856,616, or 1.80 per cent return on the stockholders' investments. Dividends of $1,233,649, or 1.2 per cent on investment, were paid during the year and $545,738 was added to surplus. Of the 76 industries, the fertilizer industry ranked 75th in net return on investment, only railroad equipment, with 1.55 per cent, showing a lower return. In fact, only 10 industries showed net returns of less than 5 per cent, while 28 showed returns above 10 per cent.

In the break-down of manufacturing costs, the following figures for the fertilizer sales dollar are given:

	Cents
Material and labor	68.96
Depreciation	3 83
Other costs	10.22
Sales expense	6.98
Advertising	0.66
Administrative and general	3.58
Taxes	1.62
Social Security	0.80
Research	0.28
Bad debts	0.59
	97.52
Other operating revenue	0.37
	97.15
Net profit	2.85
	100 00

In the figures for ratio of profits to sales, the same condition prevails. For every dollar of sales, the fertilizer manufacturers realized 2.85 cents profit. Here again the industry stood next to last, the refiners of cane sugar showing profits of only 2.12 cents per dollar of sales.

From the standpoint of percentage of profit on either investment or sales, the situation leaves much to be accomplished. The only silver lining is the fact that possibly the detractors of the industry, both within and without the government, will have to tone down their denunciations and admit, from the government's own figures, that fertilizer prices are by no means too high.

CALLISTER IN CANADIAN AGRICULTURAL WAR WORK

G. J. Callister, formerly vice-president of the American Potash Institute, has been appointed general secretary of the Canadian Society of Technical Agriculturists, with headquarters in Ottawa, for the duration of the war. A veteran of the last war and a British citizen, he resigned his position at the outbreak of the present war to live on his farm at Beamsville, Ontario, and render whatever service possible to his country. His wide experience in the field of technical agriculture, combined with his contacts with practical and current farm problems, fits him unusually well for his new duties, which he will assume on November 1st. His address will be Confederation Building, Ottawa.

Obituary

HUGH MILLER

Hugh Miller, former purchasing agent for the Virginia-Carolina Chemical Corporation, died at Asheville, N. C. on October 13th, age, 73 years. A son of the late Governor William R. Miller, of Arkansas, Mr. Miller located in Richmond in his youth and became associated with the Virginia-Carolina Chemical Company at the time of its organization in 1895. He advanced to the position of purchasing agent which office he filled until ill health forced his retirement about three years ago. He had a wide circle of friends in the fertilizer industry who will mourn his passing.

FERTILIZERS ONLY SMALL PART OF FARM EXPENSES

Farmers expenditures for fertilizer are relatively small when compared with other types of expenditures. The U. S. Department of Agriculture recently released figures on farm production expenses from 1910 through 1940. For 1940 the figures are as follows:

	Amount (Millions of Dollars)	Per Cent of Total
Feed purchased	739	12.2
Livestock purchased	446	7.3
Fertilizer and lime	282	4.6
Cost of operating motor vehicles	501	8.2
Miscellaneous operating expenses	813	13.4
Maintenance or depreciation:		
Buildings	441	7.3
Motor vehicles	314	5.2
Machinery and equipment	301	4.9
Hired labor	751	12.4
Taxes	460	7.6
Interest	463	7.6
Rent paid	566	9.3
Total production expenses	6,077	100.0

RAIL RATES TO CONVENTION

For transportation to the N. F. A. Atlanta Convention, November 17th-19th, a thirty-day round-trip ticket at 1½ times the regular first-class fare, plus tax, is in effect to Atlanta from all rail stations on rail lines south of the Ohio and Potomac Rivers and east of the Mississippi River, including Cairo, Ill.; Cincinnati, Ohio; Evansville, Ind.; and Washington, D. C. Those leaving from points north and west of these rivers, in order to take advantage of these rates, should buy their tickets from local representatives of one of the roads entering Atlanta, rather than from the regular ticket office. For example, if leaving from New York and entering Atlanta over the Seaboard or Southern, tickets should be bought from the New York office of the Seaboard or Southern, whichever is used out of Washington. The return trip can be made by an Alternate route, if desired.

OUTPUT OF COTTONSEED MEAL

During the first two months of the current crop year, from August 1st to September 30th, receipts of cottonseed at the mills amounted to 1,145,117 tons, compared with 725,422 tons during the same period of 1940. The production of cake and meal during these months amounted to 227,115 tons, compared with 193,449 tons during August and September, 1940. Stocks of cake and meal on hand September 30th were 174,385 tons in 1941 and 96,560 tons in 1940.

Priority for Repair Materials Extended

ON October 16th, the Division of Priorities of the Office of Production Management announced that the A-10 priority rating covering maintenance and repair materials had been extended to cover all governmental units and practically all manufacturing, processing, and fabricating enterprises, as well as common and contract carriers, communications and other classes of institutions and business. The statement of the Division of Priorities is as follows:

OFFICE OF PRODUCTION MANAGEMENT

Division of Priorities

Hundreds of thousands of the nation's industrial plants, big and small, were granted the use of an A-10 priority rating to obtain maintenance and repair materials, in line with the recently expressed policy of the Supply Priorities and Allocations Board of keeping the economy in good running order.

The rating granted by the Priorities Division of OPM, also can be used to obtain operating supplies (fuel, for example) which are used up in the manufacturing process.

Retail establishments are excluded, at least for the time being, because of administrative difficulties inherent in operating a maintenance and repair plan in the field. But, generally speaking, the sweeping order extends priority assistance to many others in all segments of the American economy. The plan is set forth in an amendment to a previous order (P-22).

Those granted the use of the A-10 rating, which is a defense rating include:

(i) any governmental unit;

(ii) any individual, partnership, association, corporation, or other form of enterprise engaged in one or more of the following activities or acting in one or more of the following capacities to the extent that it is so engaged or so acts:

(a) manufacturing, processing, or fabricating;

(b) warehousing—maintaining warehouses for storage or distribution of any material;

(c) wholesaling—acting as a distributor of products sold to manufacturers, wholesalers, retailers, or other persons not consumers.

(d) charitable institutions—any charitable or eleemosynary institution which is recognized as such for purposes of the Internal Revenue Laws of the United States;

(e) carriers—urban, suburban and interurban common or contract carriers of passengers or freight by electric railway, electric coach, motor truck, or bus, including terminals; shipping—commercial carriers of freight and passengers by ocean, lake, river, or canal, including terminals;

(f) educational institutions (including vocational training);

(g) printers and publishers;

(h) radio — commercial broadcasting and communications;

(i) telephone and telegraph communications; including wire services;

(j) hospitals, clinics and sanatoriums;

(k) petroleum—discovery, development and depletion of petroleum pools.

Any plant or business qualified to use the rating can do so without making application for its use. If a manufacturer needs a repair part,

(Continued on page 22)

FERTILIZER MATERIALS MARKET

NEW YORK

Lower Prices in Organic Materials Quoted, But Return to Former Figures Expected. Chilean Nitrate of Soda Prices Continued.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, October 22, 1941.

Organic fertilizer materials weakened along with the lower prices in many commodities last week. As far as could be determined, there was no real reason for the weakening, and reaction has already set in, with the probability that most materials will reach their former figure before long.

The situation in sulphate of ammonia, potash and superphosphate remains unchanged, all these materials being very scarce.

There seems to have been some special interest in sulphate of potash, but this material is only obtainable from second hands at very high prices.

Nitrate of Soda

Previously the Chilean price on nitrate of soda had only been announced for shipment through October, but new price announcement has just been made continuing the previous price, subject to change without notice, applying for deliveries until December 31, 1941. These prices are: in bulk, $30.00 per ton of 2000 lbs.; in 100-lb. bags, $33.00 per ton; in 200-lb. bags, $32.40 per ton. Prices basis f.o.b. cars at sellers' Atlantic and Gulf port warehouses in carload quantities, for shipment rail or boat.

Nitrogenous

There has been no change in this market; material is scarce and prices steady. East Coast production is quoted at $2.75 to $3.00 ($3.34½-3.64½) per unit N).

Tankage

Feeding grades of tankage dropped 25 cents per unit and local production was offered at $4.75 (5.77½ per unit N) and 10 cents, bulk, basis N. Y. Imported material is priced at the same level.

Dried Blood

Very little business is being transacted. Sellers made a slight price reduction to $4.25 ($5.16½ per Unit N).

BALTIMORE

Continued Drought Reduces Fall Tonnage Materially. Chemical Materials Continue Scarce. Slight Drop in Bag Prices.

Exclusive Correspondence to "The American Fertilizer."

BALTIMORE, October 21, 1941.

The fall season is now drawing to a belated close, and on account of the drought existing during the past six or seven weeks in this section, it is estimated that the tonnage will fall short by 20 to 25 per cent of the amount shipped last fall.

Ammoniates.—Ground animal tankage, while still too high for fertilizer purposes, is ruling slightly easier, being in the neighborhood of $5.25 per unit of nitrogen and 10 cents per unit of B.P.L., f.o.b. Baltimore.

Blood.—This is also lower, about $4.60 per unit of nitrogen, c.a.f. Baltimore.

Nitrogenous Material.—The market continues quiet, although offerings are few and far between. The nominal market is unchanged around $4.00 per unit of nitrogen, f.o.b. Baltimore.

Sulphate of Ammonia.—All of the fertilizer manufacturers are conserving their stocks for the coming spring season, and there is practically no resale on the market. First hands are not taking on any additional business, although the nominal market continues to be $29.00 per ton, in bulk, even though there is none obtainable at this figure.

Nitrate of Soda.—Importers of the Chilean product have announced that current prices will carry through December 31, 1941 at $30.00 per ton in bulk; $33.00 per ton in 100-lb. bags and $32.40 in 200-lb. bags, f.o.b. port warehouses. Importers are hopeful that they will have sufficient supplies of the Chilean product to provide for the normal requirements of farmers, fertilizer manufacturers and defense industries for the year ending June 30, 1942.

Fish Scrap.—There have been no further sales and the market remains nominally $5.50

per unit of nitrogen and 10 cents per unit of B.P.L., f.o.b. fish factories, in bulk. Fish meal guaranteed 60 per cent protein is now quoted at $68.00 per ton, in 100-lb. bags, f.o.b. Baltimore.

Superphosphate.—The market remains unchanged at $9.50 per ton of 2,000 lb., basis 16 per cent for run-of-pile, and $10.00 for flat 16 per cent grade, both in bulk, f.o.b. Baltimore. Some of the producers are reported to be completely sold up.

Bone Meal.—Business in this material is practically at a standstill, with 3 and 50 per cent steamed bone meal being quoted at $37.50 to $38.00 per ton, while 4½ and 47 per cent raw bone meal is priced at $37.50 to $38.50 per ton of 2,000 lb., f.o.b. Baltimore.

Potash.—Business in this commodity is practically at a standstill with producers not disposed to take on further business.

Bags.—With the fall season over, no further interest is being shown in bags for spring, and the market for March/May is about $185.25 per thousand for plain, new, 10 oz. basis 40 cut 54 in., delivered Baltimore, which represents a reduction of almost $5.00 per thousand since last report.

CHARLESTON

Materials Scarce and Few Sales Made. Drop in Prices of Blood and Cottonseed Meal.

Exclusive Correspondence to "The American Fertilizer."

CHARLESTON, October 21, 1941.

Nitrogenous.—This continues fairly scarce. Quoted around $2.85 ($3.46½ per unit N) delivered Southeastern ports.

Blood.—The market reacted from $4.25 to $4.15 ($5.04½ per unit N), c.i.f. New York with slim chances of working Norfolk or Jacksonville. Bulk is quoted at $4.60 ($5.59 per unit N), f.o.b. Chicago.

Fish Scrap.—No sales are being made. Price unchanged.

Cottonseed Meal.—This market has dropped further: 8 per cent grade, $41.00, Atlanta; $35.50, Memphis.

Superphosphate.—Stocks are lower than this time last season, although production has been higher.

Sulphate of Ammonia.—Heavy demand. Practically no sellers.

ATLANTA

War Developments Affect Materials Market. Short Supplies and Higher Prices Expected. Prices of Fish Products Firm.

Exclusive Correspondence to "The American Fertilizer."

ATLANTA, October 21, 1941.

The markets here in this country are still very sensitive to developments abroad. As a result of a recent development on the western front, commodities have for the most part developed a sagging tendency and trading has been restricted for the past several weeks. The long-range outlook, however, is for higher prices, as fundamentals have not changed and the demand for mineral ammoniates, due to a steady export inquiry, is greater than the potential supply with the limitations that have been put on by the Government. Organic ammoniates have been marking time and will probably respond to any increased demand with a gradual upward trend.

Fishing on the Atlantic Seaboard is about over insofar as the Chesapeake Bay area is concerned and operations are scheduled to start shortly on the Carolina Coast; but even so, the production there will doubtless be limited. West Coast prices are firm and the production thus far has been well absorbed.

Quotations are as follows:

Imported Tankage.—$4.75 ($5.77½ per unit N) and 10 cents c.i.f.

South American Blood.—$4.25 ($5.16½ per unit N), c.i.f.

Domestic Nitrogenous Tankage.—$2.40 ($2.91½ per unit N), western producing points.

Menhaden Machine Dried Scrap.—In sellers' bags, $65.00 per ton, f.o.b Norfolk or Baltimore.

Acidulated Fish.—Nothing offered.

Sulphate of Ammonia.—No change.

Nitrate of Soda.—Chilean material quoted $30.00, bulk basis f.o.b. ports for October shipment.

Cottonseed Meal.—Prime 8 per cent, $35.25 Memphis; southeastern mills, $39.00.

CHICAGO

Fertilizer Organics Market Inert. Sellers' and Buyers' Price Ideas Differ. Feed Materials Market Lower.

Exclusive Correspondence to "The American Fertilizer."

CHICAGO, October 20, 1941.

Few, if any, new developments have occurred in the western organic market. Most buyers remain on the side lines, at least for the present. Some interest has been shown, however, in nitrogenous tankage, although buyers' views are generally below sellers' ideas of price. Fertilizer tankage from packing houses is still scarce.

Consuming demand for digester tankage and meat scraps have been curtailed, no doubt owing to lower markets for hogs. Prices have been marked down.

Nominal prices are as follows: High grade ground fertilizer tankage, $3.50 to $3.75 ($4.25½ to $4.56 per unit N) and 10 cents; standard grades crushed feeding tankage, $4.75 to $5.00 ($5.77½ to $6.08 per unit N) and 10 cents; blood, $4.25 to $4.50 ($5.16½ to $5.47 per unit N); dry rendered tankage, $1.00 to $1.07½ per unit of protein, Chicago basis.

TENNESSEE PHOSPHATE

Fall Lull Overtakes Rock Shipments. Output at Record Figures to Date. AAA Accused of Misrepresenting Grades.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., October 20, 1941.

Shipments in all lines have been at a reduced rate for the past week and it looks as if the Fall lull has started in a little earlier this year, possibly because the rush in active months was so much larger. Shipments of ground rock for direct application are already ten per cent more than shipments for the entire year of 1940, the record for many years.

Shipments for account of AAA into eleven counties in Illinois, have been about one fifth of the amount estimated in the call for bids. While fixing their specifications for the lowest grade rock sold in Illinois, the AAA organization has represented the product offered by them as the highest grade, and have apparently exercised no control over the supposedly required manner of use to comply with the AAA program, so that much of the tonnage has been used in ordinary manner in vogue in Illinois, causing much loss of business to legitimate sellers of both high and low grade product.

Complaint was made to the Federal Trade Commission, but they advised that, while proceedings would lie against any individual, firm or corporation engaged in misrepresentation, false advertising and other unfair trade practices, they had no jurisdiction in case of AAA, as it was a branch of the U. S. Department of Agriculture. When the latter department was appealed to, they agreed to stop all misrepre-

Include Plenty of "Sunshine State" Potash in the Fertilizer Mix

• With the new emphasis placed in recent years upon cover crops in maintaining and improving soil fertility, has come an increasing realization of the wisdom of fertilizing these crops. Fertilizers help cover crops to make good growth and better accomplish their purpose of covering and protecting the soil, supplying humus, and in the case of legumes, fixing nitrogen from the air. Also plant nutrients turned under in the cover crop are made effectively available to following crops.

The more manufacturers feature fertilizers for cover crops containing the right proportion of potash, the greater service they are doing to the farmers who use their products, and the more new business they are creating for themselves. The value of potash in connection with soil-building crops is being demonstrated throughout the country, and potash as recommended by local agricultural authorities should be included in the mix.

Many manufacturers specify "Sunshine State" Potash because it can be depended upon for uniform analysis and easy blending.

Higrade Muriate of Potash: 62/63% K_2O • Also 50% K_2O Grade
Manure Salts: 22% K_2O Minimum

UNITED STATES POTASH COMPANY, Inc. 30 Rockefeller Plaza, New York, N. Y.

sentation interfering with private business, but, as usual in such cases, the proximate offenders are the ones on the firing line, and evidently the word failed to get down the line far enough to cause any one to "cease and desist."

The Federal Chemical Company of Louisville, Ky., has purchased the phosphate deposits on some 1,000 acres in Williamson County near Franklin. Much of this property was mined more than thirty years ago and the rock is said to be of high grade, low in silica. For the furnace production of phosphorus, the low-grade high-silica rock is quite satisfactory but for acidulation with sulphuric acid to produce superphosphate, it is practically worthless.

The Federal Chemical Company is expected to use trucks to convey rock from their new deposit to the preparation plant near Mount Pleasant, a haul of about thirty miles.

LINK-BELT SELF-ALIGNING IDLER FOR FLAT-ROLL CONVEYOR BELTS

Another new product—a swiveling, positive, self-aligning idler for automatically correcting misalignment of either carrying or return runs of non-reversing conveyor belts supported on flat-roll idlers, is announced by Link-Belt Company, Indianapolis, Ind.

This new Link-Belt idler has a centrally pivoted cross member which, besides being equipped with a flat idler roll for supporting the belt, has a vertically-mounted actuating roll at each end for lightly contacting the edge of the belt when its lateral misalignment exceeds a predetermined amount.

As but a slight pressure of belt edge against actuating roll serves to swivel the idler unit on its pivot sufficiently to guide the belt automatically, quickly, positively, back to proper alignment, any possibility of injury to belt edge is said to be avoided.

When used on return runs, one idler should be placed close to tail or takeup shaft so that the belt will be guided centrally on the pulley, and one at every ten or fifteen idler spaces. On the carrying run, one idler should be placed just beyond the loading chute, and one at every ten or fifteen spaces thereafter.

For flat-roll belt conveyors that must operate in either direction, self-aligning idlers of special design are available. Folder A-599 gives sizes, dimensions, weights and list prices.

FARM OUTLOOK IMPROVING

"Farmers have best economic prospects in years," according to a summary of the economic outlook for farmers compiled and published by the U. S. Department of Agriculture. "Prices, income and purchasing power are reported at high levels. But costs of production —farm wages and materials used in production—also are rising. Continuing good consumer demand for farm products, increased Government buying of food, and Government loans and other supports to prices are cited in the farm outlook for 1942. Fall harvests now being made assure dairymen, poultrymen, hog growers and cattlemen abundant feed for stock this winter. Feed and food granaries and warehouses are reported well stocked for winter needs in this country and for export of food to Britain."

PHOSPHATE FREIGHT PARLEY

The users of phosphate rock in the Baltimore section have been unable to obtain a satisfactory rail freight rate on rock from Norfolk to Baltimore, following a conference with railroad representatives held at Baltimore. The railroads have set a rate of $1.50 per ton, effective November 11th while the receivers are asking a rate of 50 cents, basing their claim on the rail rate of $4.50 per ton from the mines to Norfolk.

A Complete Service

THE strategic factory locations of the American Agricultural Chemical Company, as shown on the accompanying map, assure prompt, dependable service for the complete line of products listed below.

We manufacture all grades of Commercial Fertilizers, Superphosphate, Agrinite Tankage, Bone Black, Bone Black Pigments (Cosmic Black), Dicalcium Phosphate, Monocalcium Phosphate, Gelatin, Glue, Ground Limestone, Crushed Stone, Agricultural Insecticides (including Pyrox, Arsenate of Lead, Calcium Arsenate, etc.), Trisodium and Disodium Phosphate, Phosphorus, Phosphoric Acid, Sulphuric Acid, Salt Cake; and we are importers and/or dealers in Nitrate of Soda, Cyanamid, Potash Salts, Sulphate of Ammonia, Raw Bone Meal, Steamed Bone Meal, Sheep and Goat Manure, Fish, Blood and Tin-Tetrachloride. We mine and sell all grades of Florida Pebble Phosphate Rock.

FACTORIES

Alexandria, Va.
Baltimore, Md.
Buffalo, N. Y.
Carteret, N. J.
Cayce, S. C.
Chambly Canton, Quebec, Can.
Charleston, S. C.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.
East Point, Ga.
East St. Louis, Ill.
Greensboro, N. C.
Havana, Cuba
Henderson, N. C.
Montgomery, Ala.
Norfolk, Va.
No. Weymouth, Mass.
Pensacola, Fla.
Pierce, Fla.
Port Hope, Ont., Can.
Presque Isle, Me.
Savannah, Ga.
Searsport, Maine
South Amboy, N. J.
Spartanburg, S. C.
West Haven, Conn.
Wilmington, N. C.

The AMERICAN AGRICULTURAL CHEMICAL Co.

50 Church Street, New York City

SALES OFFICES

Alexandria, Va.
Baltimore, Md.
Buffalo, N. Y.
Carteret, N. J.
Charleston, S. C.
Cincinnati, Ohio
Cleveland, Ohio
Columbia, S. C.
Detroit, Mich.
East Point, Ga.
East St. Louis, Ill.
Greensboro, N. C.
Havana, Cuba
Henderson, N. C.
Houlton, Me.
Laurel, Miss.
Montgomery, Ala.
Montreal, Quebec, Can.
New York, N. Y.
Norfolk, Va.
No. Weymouth, Mass.
Pensacola, Fla.
Pierce, Fla.
Port Hope, Ont., Can.
St. Paul, Minnesota
Savannah, Ga.
Spartanburg, S. C.
Wilmington, N. C.

COMPOSITION OF AMMONIATED SUPERPHOSPHATE

(Continued from page 7)

as soon as they are applied to the soil. The degree of availability depends on a number of factors but it is generally recognized that calcium phosphates, formed in limed soils, are more available than iron and aluminum phosphates, formed in acid soils. There is some evidence to show that on acid soils the less soluble di- and tri-calcium phosphates are more available than water-soluble phosphates. Such differences are explained by differences in rate of fixation by iron and aluminum compounds in the acid soils.

Raw rock phosphate is of questionable value, compared to superphosphate, when applied to the soil direct or as an ingredient of fertilizer. On highly acid soils, rock phosphate may produce increased yields, compared to no phosphate at all. On the other hand, precipitated tri-calcium phosphate, as found in ammoniated fertilizers, is considerably more available. In this respect, it seems to be like bone meal or basic slag, materials of relatively high phosphate value. It is believed that the absence of fluorides accounts for the higher availability of these compounds when compared to rock phosphate. The fine particle size of tri-calcium phosphate, precipitated by chemical reaction within the fertilizer, may also account for better availability.

PRIORITY FOR REPAIR MATERIALS EXTENDED

(Continued from page 14)

for example, he simply places his repair order with a supplier and on the face of the order and all copies signs the following statement:

"Material for Maintenance, Repair, or Operating Supplies—Rating A-10 under Preference Rating Order P-22, as amended, with the terms of which I am familiar."

This constitutes legal use of the rating. And, since the A-10 rating denotes a defense need, the order placed must be accepted by the supplier under the terms of Regulation No. 1. The supplier may extend the rating in the same manner if necessary to obtain materials going into the producer's order. Suppliers may use the rating for their own repair and maintenance needs, of course, if they are qualified to do so under the terms of the order.

The order emphasizes the fact that the rating granted cannot be used to obtain anything except maintenance, repair and operating supplies *as these are defined in the order.*

The phrasing of the certification to be placed on all purchase orders for such materials make it mandatory for those using the order to be familiar with *all its terms before using it.*

Certain stipulations are included in the order to prevent improper use:

1. Purchase orders for repair, maintenance and operating supplies must be made up separately from all other orders, if the rating is used.

2. The rating must not be used if the material can be obtained without a rating.

3. Producers using the rating may do so only to obtain materials in quantities which are not above certain 1940 levels as defined in the order; provided, however, that the Director of Priorities may permit larger quantities of materials to be ordered and used in proportion to any increase in operations over last year's levels.

4. Misuse of the plan may result in direct punitive action.

5. Utilities and mines covered by separate repair orders are not covered by the present order. However, the plan does apply to all other establishments previously covered by Preference Order P-22, which is now revised by the new plan.

Since the above is only an informal summary of the order's provisions, the full text of the order must be read and studied by all those who expect to use it.

MILLIMAN IN CHARGE OF INSECTICIDES

Thomas E. Milliman, whose appointment to the food section of the Office of Price Administration was announced recently, has also been placed in charge of work on insecticides and fungicides in the chemical section, according to Dr. J. K. Galbraith, director of operations.

See Page 4

Nitrogen in Georgia Agriculture*

A revolution is under way in Southern Agriculture. In the state of Georgia alone, cash crop acreage has been reduced from 4,000,000 acres to 2,750,000 acres in 10 years. In contrast, winter legume acreage has jumped 100 per cent in the same time and the amount of improved pasture has nearly doubled. It is estimated that income from hogs has doubled. Diversification is the new King!

In keeping with the trend, Georgia Coastal Plain Experiment Station at Tifton, Georgia, has carried on experimental work with a wide variety of crops. While the investigations were conducted under South Georgia conditions, it is safe to assume that the results and recommendations are applicable to wide areas of the Coastal Plain—wherever soils and climate are similar to those at Tifton.

The climate of the Lower Coastal Plain is mild and favorable for the production of a great number of food and feed crops, including pastures.

Most of the soils, being of a sandy texture, are well drained and possess physical characteristics which permit of easy tillage and management. Their native fertility is low due to parent material, vegetation and climate, and they are heavily leached and weathered. Their greatest disadvantage is their low content of organic matter and base exchange material. However, with proper crop rotation, increased use of legumes and grasses, and judicious application of commercial fertilizer, agricultural enterprises may be carried out successfully and economically.

With reference to soil fertility and crop production work, it has been shown convincingly that the three major plant food elements must be applied to most crops for best results.

While nitrogen is the most deficient element (as is almost universally the case in the South), potash is almost equally deficient in the Lower Plain.

Extensive investigations were carried out with different sources of N, P and K.

The efficiency of the various P-sources was rather erratic, with great variations occurring from year to year.

The more common K-sources did not differ very greatly in crop production, the muriate possibly being somewhat superior.

Regarding nitrogen, two types of experiments were carried out with a number of crops, namely single-source and ratio experiments. In the single-source tests, all the nitrogen was derived from one of the various N-sources, while in the ratio tests the nitrogen was compounded from several sources in order to determine the best ratio of organic to inorganic nitrogen.

Some of the findings and recommendations with respect to nitrogen fertilization follow below. It should be pointed out that these observations by the Georgia Coastal Plain Station were made over a number of years.

Cotton

"In a test with inorganic materials . . . several produced good yields of cotton." . . . "All of the organic nitrogen carriers . . . have given good results."

Because of price differential "most of the nitrogen in mixed fertilizers should be obtained from inorganics. However, it is usually desirable to obtain ¼ to ⅓ of nitrogen in mixed fertilizers from high grade organics."

Tobacco (Flue-cured)

On good tobacco soils, 24-27 lb. of nitrogen per acre should be applied in a mixed fertilizer, while on poorer soils this amount should be increased to 30 or 33 lb.

"In formulating tobacco fertilizers ⅓ of the nitrogen should be derived from some high grade organic material . . . ⅓ from materials supplying nitrogen in the nitrate form and ⅓ from standard inorganic sources of nitrogen."

In tobacco plant bed fertilizer tests, it was found that nitrogen in some form other than nitrates should be used. Organic and ammoniacal nitrogen do not leach as readily as the nitrates and give a much more satisfactory

* Reprinted from the "Organic News Letter," The Organic Nitrogen Institute, Atlanta, Ga.

growth." There is a caution against the use of excessive quantities of organics.

Tobacco (Shade-Grown)

The most profitable rate appeared to be 200 lb. of N per acre. Best results were obtained when ¾ of the N was derived from organic and ¼ from nitrate nitrogen.

Sweet Potatoes

A combination of ⅔ organic and ⅓ inorganic is proving more productive and considerably more economical than any single source used.

Tomatoes

Regarding tomatoes we quote: "Data in Table No. 65 indicate that a fertilizer, in which the nitrogen is derived from both organic and mineral sources is preferable for tomato production." The nitrogen compounded ½ from inorganic and ½ from organic sources was the best producer.

Watermelons

The highest yields and net returns per acre resulted when ½ of the nitrogen in the mixture was derived from high grade organics with the balance from mineral sources. We quote from Bulletin No. 31, page 96: "Higher yields as shown in Table No. 72, suggest that a combination of mineral and organic nitrogen is preferable in watermelon fertilizers."

Summary

The conclusions to be drawn from this work with nitrogen fertilizers over a period of years are quite obvious. As elsewhere in the south, best yields and highest money-returns can be expected when the nitrogen in mixed fertilizers is derived in part from mineral sources and in part from high grade natural organics.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

of THE AMERICAN FERTILIZER, published bi-weekly at Philadelphia, Pa., for October 1, 1941.

STATE OF PENNSYLVANIA } ss.
COUNTY OF PHILADELPHIA }

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared A. A. Ware, who, having been duly sworn according to law, deposes and says that he is the editor of THE AMERICAN FERTILIZER, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Name of	Post-office Address
Publisher, Ware Bros. Company,	1330 Vine St., Philadelphia, Pa.
Editor, A. A. Ware,	1330 Vine St., Philadelphia, Pa.
Managing Editor, None.	
Business Manager, A. A. Ware.	1330 Vine St., Philadelphia, Pa.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Ware Bros. Company, 1330 Vine St., Philadelphia, Pa.; A. A. Ware, Wayne, Pa.; Gertrude W. Case, Flemington, N. J.; A. W. McCall, Merion, Pa.; K. F. Ware, Haddonfield, N. J.; G. L. Ware, Haddonfield, N. J.; H. W. Ferkler, Cornelia, Ga.; H. M. Paulus, Philadelphia, Pa.; T. K. Tomkins, North Hills, Pa.; H. F. Graeff, Philadelphia, Pa.; John Owens, Philadelphia, Pa.; Florence B. Zintl, Woodbury, N. J.; Mary A. Jamison, Philadelphia, Pa.; Helen W. White, Glen Rock, N. J.; Elizabeth W. McCall, Merion, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

A. A. WARE, Editor.

Sworn to and subscribed before me this 1st day of October, 1941.

A. F. WALSH,
Notary Public.

(My commission expires March 5, 1945.)

BUYERS' GUIDE

A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

This list contains representative concerns in the Commercial Fertilizer Industry, Including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

ACID BRICK
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
Chemical Construction Corp., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMO-PHOS
American Cyanamid Co., New York City.

AMMONIA—Anhydrous
Barrett Company, The, New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA LIQUOR
Barrett Company, The, New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA OXIDATION UNITS
Chemical Construction Corp., New York City.

AMMONIATING EQUIPMENT
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMONIUM NITRATE SOLUTIONS
Barrett Company, The, New York City

AUTOMATIC ELEVATOR TAKEUPS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

BABBITT
Sackett & Sons Co., The A. J., Baltimore, Md.

BAGS AND BAGGING—Manufacturers
Bagpak, Inc., New York City.
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS—Paper
Bagpak, Inc., New York City.
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS (Waterproof)—Manufacturers
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, East Point, Ga.
Bagpak, Inc., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

BAG PILERS
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.

BEARINGS
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

BELT LACING
Sackett & Sons Co., The A. J., Baltimore, Md.

BELTING—Chain
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BELTING—Leather, Rubber, Canvas
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.

BOILERS—Steam
Atlanta Utility Works, East Point, Ga.

BONE BLACK
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City.

BONE PRODUCTS
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City.
Pacific Coast Borax Co., New York City.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Dickerson Co., The, Philadelphia, Pa.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Keim, Samuel L., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

BUCKETS—Elevator
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.

CASTINGS—Iron and Steel
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.

CHEMICALS—Continued
Huber & Company, New York City.
Phosphate Mining Co., The, New York City.
Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.
Dickerson Co., The, Philadelphia, Pa.
Phosphate Mining Co., The, New York City.

CONTACT ACID PLANTS
Chemical Construction Corp., New York City.

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CYANAMID
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

DISINTEGRATORS
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DRYERS—Direct Heat
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

ELECTRIC MOTORS AND APPLIANCES
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

ELEVATORS
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ELEVATORS AND CONVEYORS—Portable
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Co., Columbus, Ohio
International Agricultural Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind

GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.

HOPPERS
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Duriron Co., Inc., The, Dayton, Ohio.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Power Transmission
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Pumping
Atlanta Utility Works, East Point, Ga.
Duriron Co., Inc., The, Dayton, Ohio.

MACHINERY—Tankage and Fish Scrap
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MAGNETS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Agricultural Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGEN SOLUTIONS
Barrett Company, The, New York City

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., Wilmington, Del.
Huber & Company, New York City.
International Agricultural Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

PANS AND POTS
Stedman's Foundry and Mach. Works, Aurora, Ind.

PHOSPHATE MINING PLANTS
Chemical Construction Corp., New York City.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Charleston Mining Co., Inc., Richmond, Va.
Huber & Company, New York City.
International Agricultural Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Phosphate Mining Co., The, New York City.
Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

PIPE—Acid Resisting
Duriron Co., Inc., The, Dayton, Ohio.

PIPES—Chemical Stoneware
Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

PLANT CONSTRUCTION—Fertilizer and Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Agricultural Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
Union Potash & Chemical Co., Chicago, Ill.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
Jett, Joseph C., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

QUARTZ
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

RINGS—Sulphuric Acid Tower
Chemical Construction Corp., New York City.

ROUGH AMMONIATES
Bradley & Baker, New York City.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

SCALES—Including Automatic Bagging
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SCRAPERS—Drag
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

SCREENS
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SEPARATORS—Air
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Including Vibrating
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Magnetic
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHAFTING
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHOVELS—Power
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SPROCKET WHEELS (See Chains and Sprockets)

STACKS
Sackett & Sons Co., The A. J., Baltimore, Md.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Hydrocarbon Products Co., New York City.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Freeport Sulphur Co., New York City.
Texas Gulf Sulphur Co., New York City.

SULPHURIC ACID
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.

SULPHURIC ACID—Continued
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Agricultural Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Agricultural Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
American Agricultural Chemical Co., New York City.

TANKAGE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
International Agricultural Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Smith-Rowland, Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

TANKS
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons, Co., The A. J., Baltimore, Md.

TILE—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

TOWERS—Acid and Absorption
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

UNLOADERS—Car and Boat
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

UREA
DuPont de Nemours & Co., E. I., Wilmington, Del.

UREA-AMMONIA LIQUOR
DuPont de Nemours & Co., E. I., Wilmington, Del.

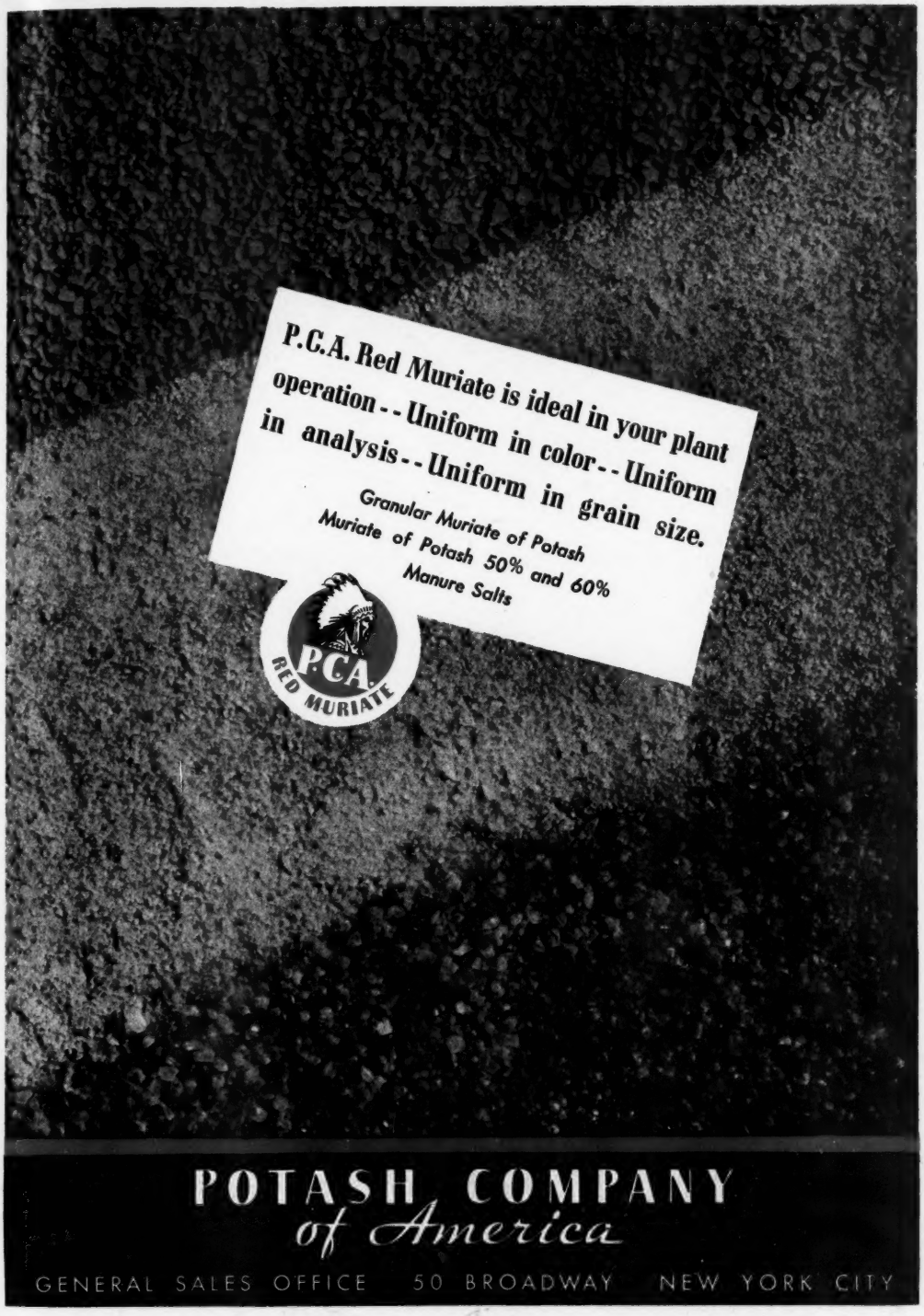
VALVES—Acid-Resisting
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

WHEELBARROW (See Carts)

ZINC SULPHATE
Tennessee Corporation, Atlanta, Ga.

ALPHABETICAL LIST OF ADVERTISERS

For Classified Index, see pages 28 to 32, inclusive


P.C.A. Red Muriate is ideal in your plant operation--Uniform in color--Uniform in analysis--Uniform in grain size.
Granular Muriate of Potash
Muriate of Potash 50% and 60%
Manure Salts
P.C.A.
RED MURIATE
POTASH COMPANY
of America
GENERAL SALES OFFICE 50 BROADWAY NEW YORK CITY